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(FILE 'USPAT' ENTERED AT 14:27:28 ON 18 JUN 92)

SET PAGELENGTH 62

SET LINELENGTH 78

L1 13 S (INTERNAL BUS) AND (TEST BUS)  
L2 0 S ((INTERNAL BUS) AND (TEST BUS))/TI,AB  
L3 0 S (INTERNAL PATH) AND (TEST PATH)  
L4 22 S (TEST PATH)/TI,AB  
L5 17 S (TEST BUS)/TI,AB  
L6 7 S (INTERNAL BUS) (P) (TEST BUS)  
E NINTENDO/IN  
E NINTENDO/ASN  
L7 82 S E3  
L8 0 S GLOVE AND L7  
L9 34 S POWER AND L7  
L10 231 S GLOVE#(10A)SENS?  
L11 53 S GLOVE#(10A)SENSOR#  
L12 10 S GLOVE#(10A)SENSOR#/CLM  
L13 8 S GLOVE#(10A)SENSOR#/TI,AB  
L14 7 S L12 NOT L13  
L15 14 S 4414537/UREF  
L16 0 S 4988981/UREF  
L17 7 S 4524348/UREF  
L18 4 S L17 NOT L15  
L19 0 S 4862152/UREF

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L3 0 S (INTERNAL PATH) AND (TEST PATH)  
L4 22 S (TEST PATH)/TI,AB  
L5 17 S (TEST BUS)/TI,AB  
L6 7 S (INTERNAL BUS) (P) (TEST BUS)  
E NINTENDO/IN  
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L11 53 S GLOVE#(10A)SENSOR#  
L12 10 S GLOVE#(10A)SENSOR#/CLM  
L13 8 S GLOVE#(10A)SENSOR#/TI,AB  
L14 7 S L12 NOT L13  
L15 14 S 4414537/UREF  
L16 0 S 4988981/UREF  
L17 7 S 4524348/UREF  
L18 4 S L17 NOT L15

=> d 1-4 cit date ab

1. 5,111,005, May 5, 1992, Graphics tablet with N-dimensional capability;  
Paul D. Smith, et al., 178/19; 340/710 [IMAGE AVAILABLE]

L18: 1 of 4  
TITLE: Graphics tablet with N-dimensional capability  
US PAT NO: 5,111,005 DATE ISSUED: May 5, 1992  
[IMAGE AVAILABLE]  
APPL-NO: 07/592,796 DATE FILED: Oct. 4, 1990

ABSTRACT:

A digitizer tablet and puck(cursor) for use therewith, characterized that in one aspect the puck is provided with at least one additional control which will provide the user with the ability to control at least one N-dimensional signal in addition to the normal X-Y coordinate data. In accordance with another aspect, any pointing device for the tablet is provided with the capability to control the manner in which the N-dimensional signal varies in response to user manipulation of the pointing device.

2. 5,059,959, Oct. 22, 1991, Cursor positioning method and apparatus; George Barry, 340/709, 711 [IMAGE AVAILABLE]

L18: 2 of 4  
TITLE: Cursor positioning method and apparatus  
US PAT NO: 5,059,959 DATE ISSUED: Oct. 22, 1991  
[IMAGE AVAILABLE]  
APPL-NO: 06/740,641 DATE FILED: Jun. 3, 1985

ABSTRACT:

A cursor-aiming system for use with a screen having a movable cursor is provided with means for generating a field and means for changing the position of the cursor on the screen in response to the movement of an operator's finger in the field. In one embodiment there is provided a plurality of monostatic sonars and in another embodiment there is provided a plurality of bistatic sonars. The sonars are mounted for the transmission and reception of acoustic signals through apertures located in a spaced relationship along the upper margin of a terminal keyboard. In typical embodiments the signal frequency is approximately 200 KHz. Either pulsed or continuous-wave signals may be employed. When pulses are used, a typical pulse rate is 200 pps with a pulse width of 25 microseconds. Multiple frequency systems comprise alternate pulses of 200 and 250 KHz. Interpulse intervals are dithered to discriminate against around-the-timebase echoes.

3. 4,862,152, Aug. 29, 1989, Sonic positioning device; Ronald E. Milner, 340/712; 178/18; 367/104, 117, 907; 901/1 [IMAGE AVAILABLE]

L18: 3 of 4

TITLE:	Sonic positioning device		
US PAT NO:	4,862,152 [IMAGE AVAILABLE]	DATE ISSUED:	Aug. 29, 1989
APPL-NO:	06/694,765	DATE FILED:	Jan. 25, 1985

**ABSTRACT:**

A three-dimensional ultrasonic position control device suitable for controlling computer displays or robot movements is disclosed. More specifically, signals from an ultrasonic transmitter are received by multiple receivers. The received signals are processed by a processing circuit which provides signals to a computer system for use in controlling a computer display or a robot. This system is particularly adapted to use inexpensive components to provide for a low cost mass producible control device.

4. 4,746,914, May 24, 1988, Cathode ray tube for use in a touch panel display system; Robert Adler, 340/712; 178/18; 333/153; 341/22

L18: 4 of 4

TITLE:	Cathode ray tube for use in a touch panel display system		
US PAT NO:	4,746,914	DATE ISSUED:	May 24, 1988
		DISCL-DATE:	Oct. 13, 2004
APPL-NO:	06/741,975	DATE FILED:	Jun. 6, 1985
REL-US-DATA:	Continuation-in-part of Ser. No. 698,306, Feb. 5, 1985, Pat. No. 4,750,176.		

**ABSTRACT:**

A cathode ray tube for use in a touch panel system that is capable of recognizing touch positions along a coordinate axis of a touch display surface of the system has a flat glass faceplate capable of propagating surface acoustic waves. An input surface wave transducer, acoustically coupled to the touch display surface, serves to launch a burst of surface waves on that surface. At least one array of wave reflective elements are disposed in or on the touch display surface for directing the surface waves derived from the input transducer across the touch display surface.

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L12 10 S GLOVE#(10A)SENSOR#/CLM  
L13 8 S GLOVE#(10A)SENSOR#/TI,AB  
L14 7 S L12 NOT L13  
L15 14 S 4414537/UREF

=> d 1-14 cit date ab

1. 5,119,709, Jun. 9, 1992, Initial touch responsive musical tone control device; Hideo Suzuki, et al., 84/600, 658 [IMAGE AVAILABLE]

L15: 1 of 14

TITLE:	Initial touch responsive musical tone control device		
US PAT NO:	5,119,709	DATE ISSUED:	Jun. 9, 1992
	[IMAGE AVAILABLE]		
APPL-NO:	07/509,290	DATE FILED:	Apr. 13, 1990
FRN-PR. NO:	1-95656	FRN FILED:	Apr. 14, 1989
FRN-PR. CO:	Japan		
FRN-PR. NO:	1-95657	FRN FILED:	Apr. 14, 1989
FRN-PR. CO:	Japan		

ABSTRACT:

A musical control device comprising a position detection device whereby the position of a portion of a performer's body is detected and output as a position signal, a velocity detection circuit whereby the velocity of the portion of the performer's body is detected and output as velocity data based on the change in the above mentioned position signal, and a musical control signal output circuit whereby a musical control signal is generated and output based on said position signal and velocity data.

2. 5,097,252, Mar. 17, 1992, Motion sensor which produces an asymmetrical signal in response to symmetrical movement; Young L. Harvill, et al., 340/540; 73/655; 200/DIG.2; 250/227.14, 227.16, 227.24, 227.28; 340/407, 600; 341/20, 31; 385/13 [IMAGE AVAILABLE]

L15: 2 of 14

L15: 2 of 14

TITLE: Motion sensor which produces an asymmetrical signal in

US PAT NO: 5,097,252 DATE ISSUED: Mar. 17, 1992  
[IMAGE AVAILABLE]  
APPL-NO: 07/427,970 DATE FILED: Oct. 26, 1989  
REL-US-DATA: Continuation of Ser. No. 29,934, Mar. 24, 1987, abandoned.

**ABSTRACT:**

In one embodiment of the invention, a plurality of sensors are placed over the joints of a hand. Each motion sensor comprises an optical fiber disposed between a light source and a light sensor. An upper portion of the fiber is treated so that transmission loss of light being communicated through the optical fiber is increased only when the fiber bends in one direction. In another embodiment of the invention, a flexible tube is disposed in close proximity to a finger joint and bends in response to bending of the finger. A light source and light sensor are provided on opposite ends of the tube for continuously indicating the extent of bending of the tube. A wedge is disposed between the tube and the finger for setting the tube straight when the finger is hyperextended for eliminating the symmetry of the output signal which ordinarily would result from bending of the tube on opposite sides of the axis of movement. In a further embodiment of the invention, a light source and light sensor are positioned in close proximity to a finger joint so that bending of the finger toward the palm causes the source and sensor to move away from each other. Bending the finger in the opposite direction causes the source and sensor to move toward each other.

3. 5,047,952, Sep. 10, 1991, Communication system for deaf, deaf-blind, or non-vocal individuals using instrumented glove; James P. Kramer, et al., 395/2; 341/20; 381/36; 434/229 [IMAGE AVAILABLE]

L15: 3 of 14

TITLE: Communication system for deaf, deaf-blind, or non-vocal individuals using instrumented glove  
US PAT NO: 5,047,952 DATE ISSUED: Sep. 10, 1991  
[IMAGE AVAILABLE]  
APPL-NO: 07/258,204 DATE FILED: Oct. 14, 1988

**ABSTRACT:**

A communication system for deaf, deaf-blind, or non-vocal individuals includes an instrumented glove for obtaining electrical signals indicative of a hand configuration of a first individual. Strain gage sensors in the glove flex with movement of the hand. Each sensor includes a tension strain gage and a compression strain gage which are serially connected and form two legs in a bridge circuit. Signals from the bridge circuit are amplified and digitized and applied to a computer which includes an adaptive pattern recognition algorithm which is responsive to hand-state vectors for recognizing letter beacons in hand-space. A second individual communicates with the first individual through the computer system using a portable keyboard. The output devices for communicating to the first and second individuals depend on the visual, vocal and hearing capabilities of the individuals and can be selected from a voice synthesizer, LCD monitor, or braille display.

4. 5,005,460, Apr. 9, 1991, Musical tone control apparatus; Hideo Suzuki, et al., 84/600, 615, 622, 644 [IMAGE AVAILABLE]

L15: 4 of 14

TITLE: Musical tone control apparatus

US PAT NO: 5,005,460

DATE ISSUED: Apr. 9, 1991

L15: 4 of 14

[IMAGE AVAILABLE]

APPL-NO:	07/289,181	DATE FILED:	Dec. 22, 1988
FRN-PR. NO:	62-328061	FRN FILED:	Dec. 24, 1987
FRN-PR. CO:	Japan		
FRN-PR. NO:	62-328062	FRN FILED:	Dec. 24, 1987
FRN-PR. CO:	Japan		
FRN-PR. NO:	62-328064	FRN FILED:	Dec. 24, 1987
FRN-PR. CO:	Japan		
FRN-PR. NO:	62-328065	FRN FILED:	Dec. 24, 1987
FRN-PR. CO:	Japan		
FRN-PR. NO:	62-328066	FRN FILED:	Dec. 24, 1987
FRN-PR. CO:	Japan		
FRN-PR. NO:	62-328067	FRN FILED:	Dec. 24, 1987
FRN-PR. CO:	Japan		
FRN-PR. NO:	62-328797	FRN FILED:	Dec. 25, 1987
FRN-PR. CO:	Japan		

**ABSTRACT:**

A musical tone control apparatus comprises a main unit and at least one detector for detecting movement of player's finger, hand and the like. The main unit can be mounted on a player's wrist by use of a belt. When plural detectors are provided for detecting movements of player's fingers, tone color, tone pitch of musical tone or key-on timing is controlled based on combination of bent fingers. In order to detect bending of each finger, a joint switch is provided for each finger. In order to prevent deviation of key-on signals, a comparator is further used for comparing the predetermined threshold value with detection value corresponding to the bending of each finger so that the key-on signal is generated when the detection value exceeds the threshold value.

5. 4,988,981, Jan. 29, 1991, Computer data entry and manipulation apparatus and method; Thomas G. Zimmerman, et al., 340/706, 709 [IMAGE AVAILABLE]

L15: 5 of 14

TITLE:	Computer data entry and manipulation apparatus and method		
US PAT NO:	4,988,981	DATE ISSUED:	Jan. 29, 1991
[IMAGE AVAILABLE]			
APPL-NO:	07/317,107	DATE FILED:	Feb. 28, 1989
REL-US-DATA:	Continuation of Ser. No. 26,930, Mar. 17, 1987, abandoned.		

**ABSTRACT:**

Apparatus is disclosed for generating control signals for the manipulation of virtual objects in a computer system according to the gestures and positions of an operator's hand or other body part. The apparatus includes a glove worn on the hand which includes sensors for detecting the gestures of the hand, as well as hand position sensing means coupled to the glove and to the computer system for detecting the position of the hand with respect to the system. The computer system includes circuitry connected to receive the gesture signals and the hand position signals for generating control signals in response thereto. Typically, the control signals are used to manipulate a graphical representation of the operator's hand which is displayed on a monitor coupled to the computer system, and the graphical representations of the operator's hand manipulates virtual objects or tools also displayed by the computer.

6. 4,937,444, Jun. 26, 1990, Optical flex sensor; Thomas G. Zimmerman, 250/231.1, 221; 341/31 [IMAGE AVAILABLE]

L15: 6 of 14

L15: 6 of 14

TITLE: Optical flex sensor  
US PAT NO: 4,937,444 DATE ISSUED: Jun. 26, 1990  
[IMAGE AVAILABLE]  
APPL-NO: 07/418,919 DATE FILED: Oct. 5, 1989  
REL-US-DATA: Continuation of Ser. No. 218,426, Jul. 8, 1988, abandoned, which is a continuation of Ser. No. 892,888, Jul. 29, 1986, abandoned, which is a continuation of Ser. No. 745,035, Aug. 1, 1985, abandoned, which is a division of Ser. No. 428,322, Sep. 29, 1982, Pat. No. 4,542,291, Sep. 17, 1985.

ABSTRACT:

An optical flex sensor is provided and consists of a flexible tube having two ends, a reflective interior wall within the flexible tube and a light source placed within one end of the flexible tube and a photosensitive detector placed within the other end of the flexible tube to detect a combination of direct light rays and reflected rays when the flexible tube is bent.

7. 4,905,001, Feb. 27, 1990, Hand-held finger movement actuated communication devices and systems employing such devices; Henry C. Penner, 341/20; 340/407; 341/21; 434/114

L15: 7 of 14

TITLE: Hand-held finger movement actuated communication devices and systems employing such devices  
US PAT NO: 4,905,001 DATE ISSUED: Feb. 27, 1990  
APPL-NO: 07/105,597 DATE FILED: Oct. 8, 1987

ABSTRACT:

Disclosed are various forms of hand-held communication devices which serve as alternatives to a keyboard and which, in addition, allow the user to receive communications via the sense of touch. Although not so limited, the device is well-adapted for use by persons who are speechless, deaf and speechless, or even blind, deaf and speechless. The present invention provides particularly compact and efficient finger movement actuated communication devices for individually responding to thrust and push motions of at least one finger of a person's hand. Thus, each finger can operate two switch elements, and the four fingers of a person's hand can operate eight switch elements in predetermined combinations suitable, for example, for communication in a binary code. In a first disclosed embodiment, a handle-like body supports eight switch actuators arranged as four pairs, with each of the pairs corresponding to a particular finger. The two switch actuators are positioned for selective activation by distal and proximal segments of a single finger. In a second disclosed embodiment, four switch actuators are provided for actuation by the fleshly portions of a person's fingertips. Each of the switch actuators supports two distinct types of movement, pushing and sliding, and corresponding operate a pair of switch elements. In a third disclosed embodiment, collar-like rings are worn about the proximal and middle segments of the user's hand. Relative motion between the collar-like rings and a wrist harness is sensed in order to respond to thrust and push

motions of the fingers.

8. 4,878,843, Nov. 7, 1989, Process and apparatus for conveying information through motion sequences; Nina J. Kuch, 434/112; 352/39, 51 [IMAGE AVAILABLE]

L15: 8 of 14

TITLE: Process and apparatus for conveying information through motion sequences  
US PAT NO: 4,878,843 DATE ISSUED: Nov. 7, 1989  
[IMAGE AVAILABLE]

APPL-NO: 07/203,818 DATE FILED: Jun. 8, 1988

ABSTRACT:

The disclosure provides a process and an apparatus for a system of animation and a system of teaching finger spelling.

9. 4,849,732, Jul. 18, 1989, One hand key shell; Heinz C. Dolenc, 341/20; 200/5R; 341/23; 400/100, 486, 489 [IMAGE AVAILABLE]

L15: 9 of 14

TITLE: One hand key shell  
US PAT NO: 4,849,732 DATE ISSUED: Jul. 18, 1989  
[IMAGE AVAILABLE]  
APPL-NO: 07/175,684 DATE FILED: Mar. 21, 1988  
REL-US-DATA: Continuation of Ser. No. 769,012, Aug. 23, 1985, abandoned.

ABSTRACT:

A self-contained data terminal or typewriter keyboard completely operable by a single human hand for the input of information into a computer or other electronic device. The keyboard comprises five sets of keys, each set aligned respectively with the thumb, index finger, middle finger, ring finger, and small finger of an extended hand. Complementary orientation and positioning of the sets are determined by whether the terminal is to be used by a right-handed or left-handed user. The control keys may be used to manipulate text or other information entered into the attached device and are operated by the thumb. The character keys consist primarily of letters of the alphabet, numbers, and punctuation sets and are positioned below the remaining four fingers. The terminal is operated in a single keystroke character input mode. Several data control keys can also be mounted to the terminal to perform additional text manipulation functions, similar to the control keys, or any other necessary commands. By using single keystroke input keys according to the present invention, data input is faster and easier than with conventional terminals because only one hand is necessary, and there are fewer and less complex character input commands to memorize.

10. 4,829,174, May 9, 1989, Flexible tube optical intrusion detector; Thomas L. Booth, et al., 250/221, 222.1

L15: 10 of 14

TITLE: Flexible tube optical intrusion detector  
US PAT NO: 4,829,174 DATE ISSUED: May 9, 1989  
APPL-NO: 07/148,186 DATE FILED: Jan. 25, 1988  
REL-US-DATA: Continuation of Ser. No. 912,260, Sep. 29, 1986, abandoned.

## ABSTRACT:

A hollow flexible vinyl or other plastic tube having a shiny inner wall is disposed along a boundary where intrusion detection is desired. A beam of infrared radiation from an LED at one end of the tube is passed through the tube by reflections from the wall to a detector at the other end. The radiation is conducted along curved paths as well as straight paths. An object intruding into the protected space with sufficient force to deform the tube wall attenuates the radiation. A detection circuit senses the attenuation and produces an intrusion signal. The detection circuit includes logic which detects a failure in the radiation source or a light leak in the tube.

11. 4,713,535, Dec. 15, 1987, Optical keyboard; Randy L. Rhoades, 250/221; 340/707, 825.19; 341/21, 27

L15: 11 of 14

TITLE:	Optical keyboard		
US PAT NO:	4,713,535	DATE ISSUED:	Dec. 15, 1987
APPL-NO:	06/772,553	DATE FILED:	Sep. 4, 1985

## ABSTRACT:

An optical keyboard includes a plurality of photosensors arranged in an X-Y coordinate system where a plurality of rows represent a plurality of X-axes and a plurality of columns represent a plurality of Y-axes. Each sensor represents input to data processing means. When a beam of light is cast onto a photosensor, the photosensor is actuated to transmit a coded signal to a microprocessor board. The microprocessor board scans the array of photosensors row by row sequentially to identify the column position of an actuated photosensor. The input received from the scanning operation is converted to data and transmitted through either a serial or parallel interface to a computer. Interface circuitry converts the data to a form readable by the computer. Thus, by selectively moving a light source to desired photosensors, specific information can be transmitted to a computer for printout or for operation of other devices remotely controlled by the computer to permit the computer to be operated by individuals unable to perform manual keyboard operations.

12. 4,660,033, Apr. 21, 1987, Animation system for walk-around costumes; Gordon C. Brandt, 340/825.72; 2/69; 200/5A, 502; 341/34; 446/299, 301 [IMAGE AVAILABLE]

L15: 12 of 14

TITLE:	Animation system for walk-around costumes		
US PAT NO:	4,660,033	DATE ISSUED:	Apr. 21, 1987
	[IMAGE AVAILABLE]		
APPL-NO:	06/760,001	DATE FILED:	Jul. 29, 1985

## ABSTRACT:

A complete system for animating external features of a full size walk-around costume designed for the entertainment industry is disclosed. The animation system comprises two major parts: the costume itself and the programming/playback system. The complete system is lightweight and portable and gives complete freedom of motion to a person inside a walk-around costume. The costume is made to simulate life by the inclusion of motors or other devices which move the eyes, the eyelids, eyebrows, the ears, the nose, and the mouth. The mouth movement is controlled by a radio signal which may be synchronized with a prerecorded audio track. To give maximum spontaneity

to expression and to reduce the time required to program costume movements, all other external features are controlled by the dancer inside the costume, using newly developed pressure sensitive finger switches which are activated by bending a finger.

13. 4,542,291, Sep. 17, 1985, Optical flex sensor; Thomas G. Zimmerman, 250/231.1, 551; 341/31

L15: 13 of 14

TITLE:	Optical flex sensor		
US PAT NO:	4,542,291	DATE ISSUED:	Sep. 17, 1985
APPL-NO:	06/428,322	DATE FILED:	Sep. 29, 1982

ABSTRACT:

An optical flex sensor is provided and consists of a flexible tube having two ends, a reflective interior wall within the flexible tube and a light source placed within one end of the flexible tube and a photosensitive detector placed within the other end of the flexible tube to detect a combination of

L15: 13 of 14  
direct light rays and reflected rays when the flexible tube is bent.

14. 4,524,348, Jun. 18, 1985, Control interface; Leonard R. Lefkowitz, 341/5; 178/18; 340/706, 724 [IMAGE AVAILABLE]

L15: 14 of 14

TITLE:	Control interface		
US PAT NO:	4,524,348	DATE ISSUED:	Jun. 18, 1985
	[IMAGE AVAILABLE]		
APPL-NO:	06/535,813	DATE FILED:	Sep. 26, 1983

ABSTRACT:

A control interface between a physical object, such as a part of the human body, and a machine. Movement of the physical object in a defined field is sensed, and signals corresponding to such movement are received, detected, amplified and produced as an input signal to the machine to move an element of the machine in the same direction as, and in an amount proportional to, movement of the object. In one embodiment the machine is a video game system and the element is a display signal.

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1. 5,047,952, Sep. 10, 1991, Communication system for deaf, deaf-blind, or non-vocal individuals using instrumented glove; James P. Kramer, et al., 395/2; 341/20; 381/36; 434/229 [IMAGE AVAILABLE]

L13: 1 of 8

TITLE: Communication system for deaf, deaf-blind, or non-vocal individuals using instrumented glove  
US PAT NO: 5,047,952 DATE ISSUED: Sep. 10, 1991  
[IMAGE AVAILABLE]  
APPL-NO: 07/258,204 DATE FILED: Oct. 14, 1988

ABSTRACT:

A communication system for deaf, deaf-blind, or non-vocal individuals includes an instrumented glove for obtaining electrical signals indicative of a hand configuration of a first individual. Strain gage **sensors** in the **glove** flex with movement of the hand. Each **sensor** includes a tension strain gage and a compression strain gage which are serially connected and form two legs in a bridge circuit. Signals from the bridge circuit are amplified and digitized and applied to a computer which includes an adaptive pattern recognition algorithm which is responsive to hand-state vectors for recognizing letter beacons in hand-space. A second individual communicates with the first individual through the computer system using a portable keyboard. The output devices for communicating to the first and second individuals depend on the visual, vocal and hearing capabilities of the individuals and can be selected from a voice synthesizer, LCD monitor, or braille display.

2. 4,988,981, Jan. 29, 1991, Computer data entry and manipulation apparatus and method; Thomas G. Zimmerman, et al., 340/706, 709 [IMAGE AVAILABLE]

L13: 2 of 8

TITLE: Computer data entry and manipulation apparatus and method  
US PAT NO: 4,988,981 DATE ISSUED: Jan. 29, 1991  
[IMAGE AVAILABLE]

APPL-NO: 07/317,107 DATE FILED: Feb. 28, 1989  
REL-US-DATA: Continuation of Ser. No. 26,930, Mar. 17, 1987, abandoned.

**ABSTRACT:**

Apparatus is disclosed for generating control signals for the manipulation of virtual objects in a computer system according to the gestures and positions of an operator's hand or other body part. The apparatus includes a glove worn on the hand which includes sensors for detecting the gestures of the hand, as well as hand position sensing means coupled to the glove and to the computer system for detecting the position of the hand with respect to the system. The computer system includes circuitry connected to receive the gesture signals and the hand position signals for generating control signals in response thereto. Typically, the control signals are used to manipulate a graphical representation of the operator's hand which is displayed on a monitor coupled to the computer system, and the graphical representations of the operator's hand manipulates virtual objects or tools also displayed by the computer.

3. 4,977,903, Dec. 18, 1990, Sensory transmitting membrane device; Bernard M. Haines, 128/842, 844, 918 [IMAGE AVAILABLE]

L13: 3 of 8

TITLE: Sensory transmitting membrane device  
US PAT NO: 4,977,903 DATE ISSUED: Dec. 18, 1990  
[IMAGE AVAILABLE]  
APPL-NO: 07/509,258 DATE FILED: Apr. 13, 1990  
REL-US-DATA: Continuation-in-part of Ser. No. 409,402, Sep. 19, 1989,  
abandoned.

L13: 3 of 8

**ABSTRACT:**

A sensory transmitting membrane device having a flexible base material including a plurality of solid or hollow projections integrally connected thereto and extending from opposite sides of the membrane. The projections on one side of the membrane are offset from the projections on the opposite side of the membrane and are positioned so that an edge of the base of a projection on one side of the membrane is in proximity to the opposite edge of the base of a projection on the other side of the membrane, whereby a linear motion of one projection in a direction parallel to the membrane results in a similar motion by any cooperating projections, to thereby enhance the transmission of tactile sensations from one side of the membrane material to the other side. The sensory transmitting device is particularly useful in latex or rubber surgical gloves, finger cots or condoms.

4. 4,586,387, May 6, 1986, Flight test aid; Garth A. Morgan, et al., 73/862.05; 2/160; 73/862.58

L13: 4 of 8

TITLE: Flight test aid  
US PAT NO: 4,586,387 DATE ISSUED: May 6, 1986  
APPL-NO: 06/589,091 DATE FILED: Feb. 15, 1984  
FRN-PR. NO: PF4452 FRN FILED: Jun. 16, 1982  
FRN-PR. CO: Australia  
PCT-NO: PCT/AU83/00078 PCT-FILED: Jun. 8, 1983  
371-DATE: Feb. 15, 1984

PCT-PUB-NO: W084/00064

102(E)-DATE: Feb. 15, 1984  
PCT-PUB-DATE: Jan. 5, 1984

## ABSTRACT:

A flight test aid comprising means to measure force that is applied by a pilot to the controls (7) of an aircraft to adjust the control surfaces while manoeuvering the aircraft which utilizes a plurality of sensors (5-6) supported in the interface between the control member (7) and the part of the pilot (1) operating the control and means (9) to record the force from the sensors (5-6) preferably through differencing means (21) to cancel pressure applied equally to the sensors (5-6). A typical example is a glove (1) with finger and palm sensors (5-6) connected to indicator means (9) preferably through a differencer (21).

5. 4,580,569, Apr. 8, 1986, Apparatus and method for muscle stimulation; Jerrold S. Petrofsky, 128/420A

L13: 5 of 8

TITLE: Apparatus and method for muscle stimulation  
US PAT NO: 4,580,569 DATE ISSUED: Apr. 8, 1986  
APPL-NO: 06/561,770 DATE FILED: Dec. 15, 1983

## ABSTRACT:

A system for stimulating a grasping action by a paralyzed hand. The system includes a sensor arrangement for detecting movement of a shoulder by the paralyzed person. The sensor transmits shoulder movement signals to a computerized controller which generates stimulation signals for stimulation electrodes mounted within a cuff worn about the forearm which supports the hand to be stimulated. Closed loop control is accomplished by use of a glove to which are attached a length sensor and a pressure sensor connected for alternative selection. Stimulation of deeply buried muscles is accomplished by arranging the stimulation electrodes into side-by-side

L13: 5 of 8

electrode sets which are so positioned as to produce focusing of stimulation energy at the location of the subject muscle.

6. 4,558,704, Dec. 17, 1985, Hand control system; Jerrold S. Petrofsky, 128/423R

L13: 6 of 8

TITLE: Hand control system  
US PAT NO: 4,558,704 DATE ISSUED: Dec. 17, 1985  
APPL-NO: 06/561,720 DATE FILED: Dec. 15, 1983

## ABSTRACT:

A system for stimulating a grasping action by a paralyzed hand. The system includes a sensor arrangement for detecting movement of a shoulder by the paralyzed person. The sensor transmits shoulder movement signals to a computerized controller which generates stimulation signals for stimulation electrodes mounted within a cuff worn about the forearm which supports the hand to be stimulated. Closed loop control is accomplished by use of a glove to which are attached a length sensor and a pressure sensor connected for alternative selection. Stimulation of deeply buried muscles is accomplished by arranging the stimulation electrodes into side-by-side

electrode sets which are so positioned as to produce focusing of stimulation energy at the location of the subject muscle.

7. 4,414,984, Nov. 15, 1983, Methods and apparatus for recording and or reproducing tactile sensations; Alain Zarudiansky, 128/774; 414/5; 901/46

L13: 7 of 8

TITLE: Methods and apparatus for recording and or reproducing tactile sensations  
US PAT NO: 4,414,984 DATE ISSUED: Nov. 15, 1983  
APPL-NO: 05/969,295 DATE FILED: Dec. 14, 1978  
FRN-PR. NO: 77 38181 FRN FILED: Dec. 19, 1977  
FRN-PR. CO: France

ABSTRACT:

Apparatus for recording tactile sensations comprises a sensing or "receptor" glove used to effect a tactile exploration of an object whose "feel" is to be recorded. The glove typically includes a mosaic of pressure and temperature sensors in an "artificial skin", which is applied to the object during the tactile exploration, and is connected to further sensors for sensing the motivity parameters of the movable parts, e.g. fingers and wrist, during the exploration. The pressure and temperature sensors are preferably formed by localized diffusions of electrically conductive material into a sheet of a flexible insulating material. The electrical signals produced by the sensors are recorded, and are then used, with or without further processing, to operate apparatus for reproducing tactile sensations. This latter apparatus can comprise a motor glove for reproducing the motivity parameters, and/or a flexible membrane containing a mosaic of piston members and electrical heating elements for reproducing pressure and temperature sensations respectively.

8. 4,414,537, Nov. 8, 1983, Digital data entry glove interface device; Gary J. Grimes, 341/20; 400/475, 479.2, 489; 434/112, 229

L13: 8 of 8

TITLE: Digital data entry glove interface device  
US PAT NO: 4,414,537 DATE ISSUED: Nov. 8, 1983  
APPL-NO: 06/302,700 DATE FILED: Sep. 15, 1981

L13: 8 of 8

ABSTRACT:

A man-machine interface is disclosed for translating discrete hand positions into electrical signals representing alpha-numeric characters. The interface comprises a glove having sensors positioned with respect to the hand for detecting the flex of finger joints and sensors for detecting the contact between various portions of the hand. Additional sensors detect the movement of the hand with respect to a gravitational vector and a horizontal plane of reference. Further additional sensors detect the twisting and flexing of the wrist. The additional sensors are associated with prescribed mode signals which determine whether subsequently formed or priorly formed character specifying hand positions are to be entered for transmission. The alpha-numeric characters associated with the formed character specifying hand positions are transmitted only when the appropriate mode signal results. The forming and moving of the hand actuates various combinations of sensors so that electrical signals representing the specified characters are generated

and transmitted.

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US PAT NO: 4,988,981 [IMAGE AVAILABLE] L13: 2 of 8  
 DATE ISSUED: Jan. 29, 1991  
 TITLE: Computer data entry and manipulation apparatus and method  
 INVENTOR: Thomas G. Zimmerman, San Francisco, CA  
 Jaron Z. Lanier, Palo Alto, CA  
 ASSIGNEE: VPL Research, Inc., Redwood City, CA (U.S. corp.)  
 APPL-NO: 07/317,107  
 DATE FILED: Feb. 28, 1989

US PAT NO: 4,988,981 [IMAGE AVAILABLE] L13: 2 of 8  
 DATE ISSUED: Jan. 29, 1991  
 TITLE: Computer data entry and manipulation apparatus and method  
 REL-US-DATA: Continuation of Ser. No. 26,930, Mar. 17, 1987, abandoned.  
 INT-CL: [5] G09G 3/02  
 US-CL-ISSUED: 340/709, 709, 725  
 US-CL-CURRENT: 340/706, 709  
 SEARCH-FLD: 340/709, 706, 712, 705, 725, 6; 352/50  
 REF-CITED:

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 Exam = XIAO Wu  
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US PAT NO: 4,988,981 [IMAGE AVAILABLE]

L13: 2 of 8

DATE ISSUED: Jan. 29, 1991

TITLE: Computer data entry and manipulation apparatus and method  
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ART-UNIT: 269

PRIM-EXMR: Alvin E. Oberley

LEGAL-REP: Townsend and Townsend

ABSTRACT:

Apparatus is disclosed for generating control signals for the manipulation of virtual objects in a computer system according to the gestures and positions of an operator's hand or other body part. The apparatus includes a **glove** worn on the hand which includes **sensors** for detecting the gestures of the hand, as well as hand position sensing means coupled to the glove and to the computer system for detecting the position of the hand with respect to the system. The computer system includes circuitry connected to receive the gesture signals and the hand position signals for generating control signals in response thereto. Typically, the control signals are used to manipulate a graphical representation of the operator's hand which is displayed on a monitor coupled to the computer system, and the graphical representations of the operator's hand manipulates virtual objects or tools also displayed by

the computer.

66 Claims, 6 Drawing Figures

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(FILE 'USPAT' ENTERED AT 14:27:28 ON 18 JUN 92)

SET PAGELENGTH 62

SET LINELENGTH 78

L1 13 S (INTERNAL BUS) AND (TEST BUS)  
L2 0 S ((INTERNAL BUS) AND (TEST BUS))/TI,AB  
L3 0 S (INTERNAL PATH) AND (TEST PATH)  
L4 22 S (TEST PATH)/TI,AB  
L5 17 S (TEST BUS)/TI,AB  
L6 7 S (INTERNAL BUS) (P) (TEST BUS)  
E NINTENDO/IN  
E NINTENDO/ASN  
L7 82 S E3  
L8 0 S GLOVE AND L7  
L9 34 S POWER AND L7  
L10 231 S GLOVE#(10A)SENS?  
L11 53 S GLOVE#(10A)SENSOR#  
L12 10 S GLOVE#(10A)SENSOR#/CLM  
L13 8 S GLOVE#(10A)SENSOR#/TI,AB  
L14 7 S L12 NOT L13

=> d 1-7

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